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(54) Abstract Title
Mounting assembly for a vehicle footrest

(57) A mounting assembly for a vehicle footrest comprises a footrest body 2 having on the side to be mounted against the floor of the vehicle rigid tubular clips 5 for receiving threaded studs or the like (13 in figure 6) which are immovably fixed to the vehicle floor. The body 2 may be made from a solid block of soft material such as urethane, or it may take the form of a box having a plurality of inner walls and cavities (see figure 7). In the latter case the clips 5 are replaced by generally tubular stud receiving portions (29 in figure 7) which are of a slightly smaller diameter than the studs so as to grip them when pressed down on to the studs. The mounting assembly is intended to securely position the footrest body and absorb some of the shock of a vehicle collision.

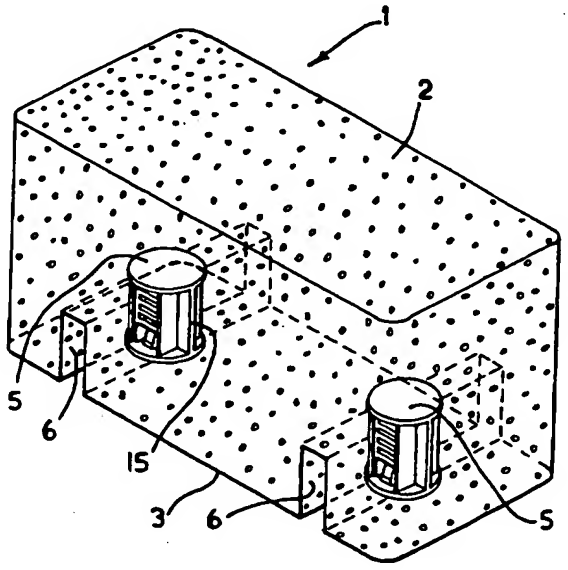

FIG. 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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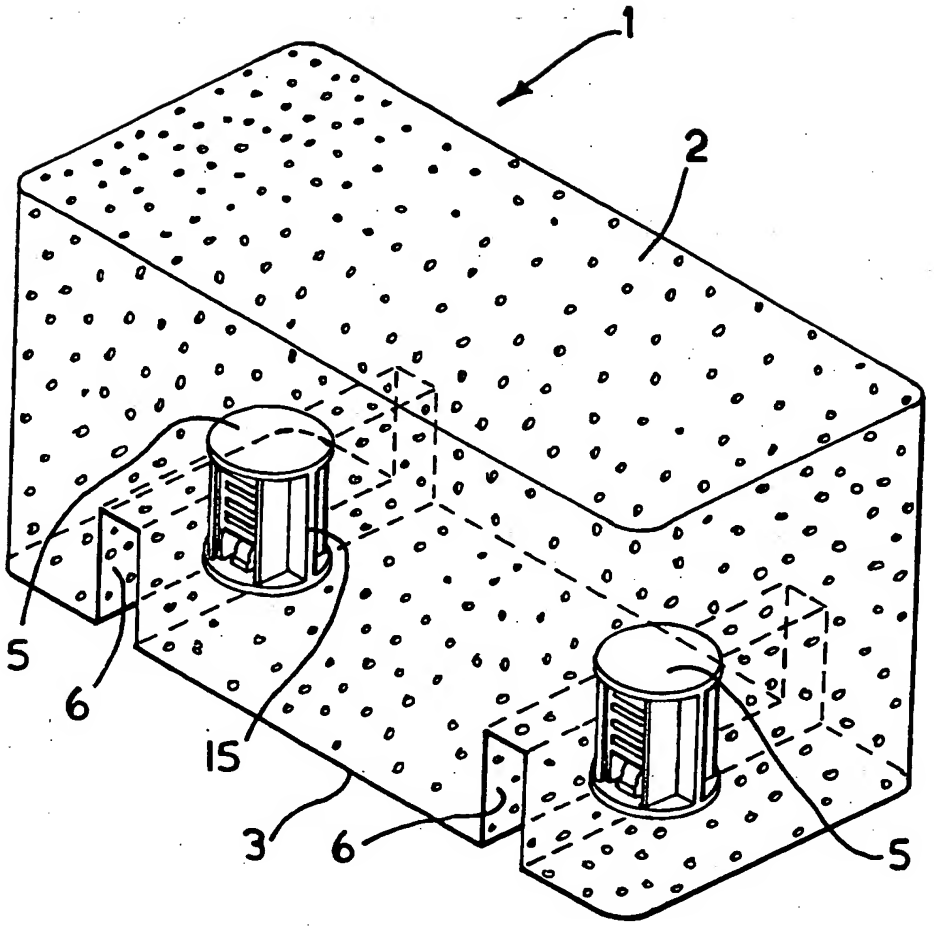

FIG. 1

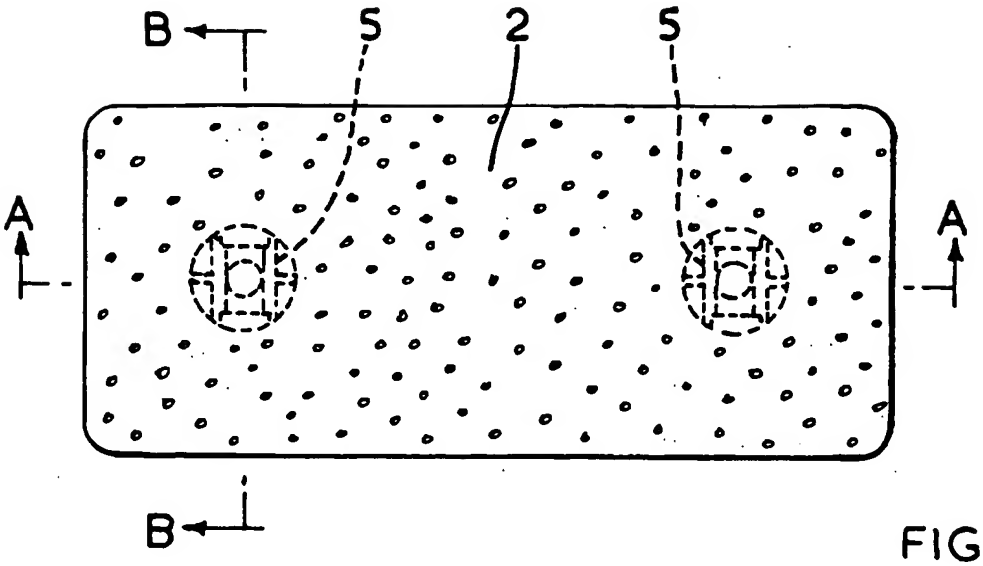

FIG. 2

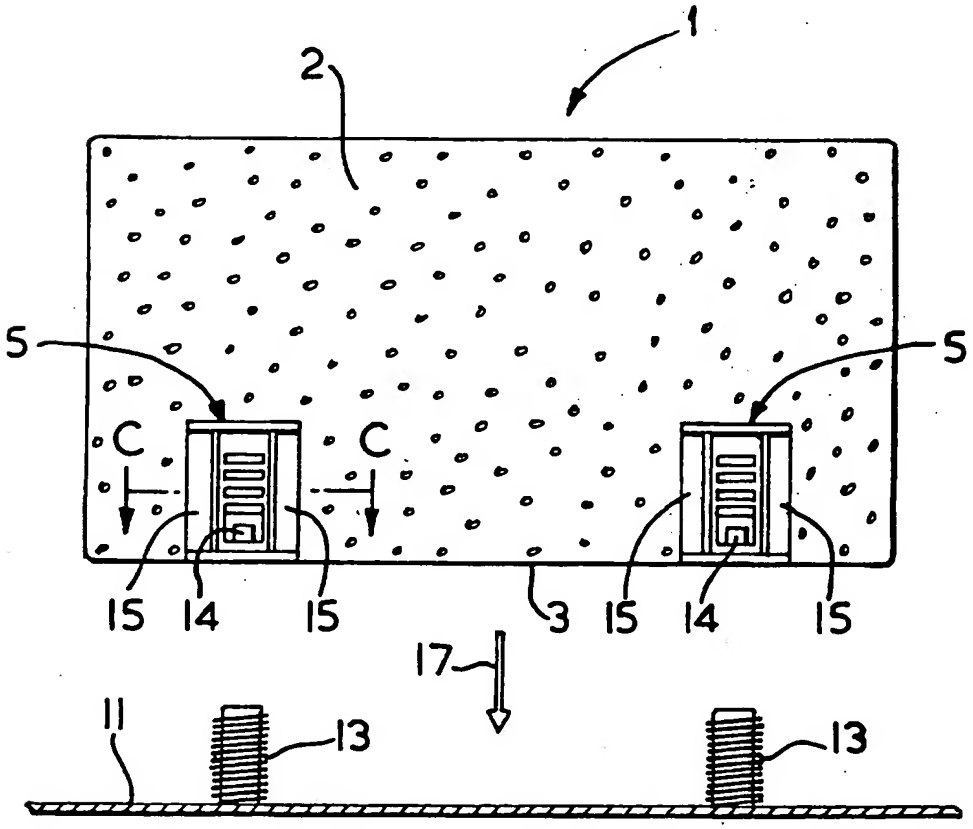

FIG. 3

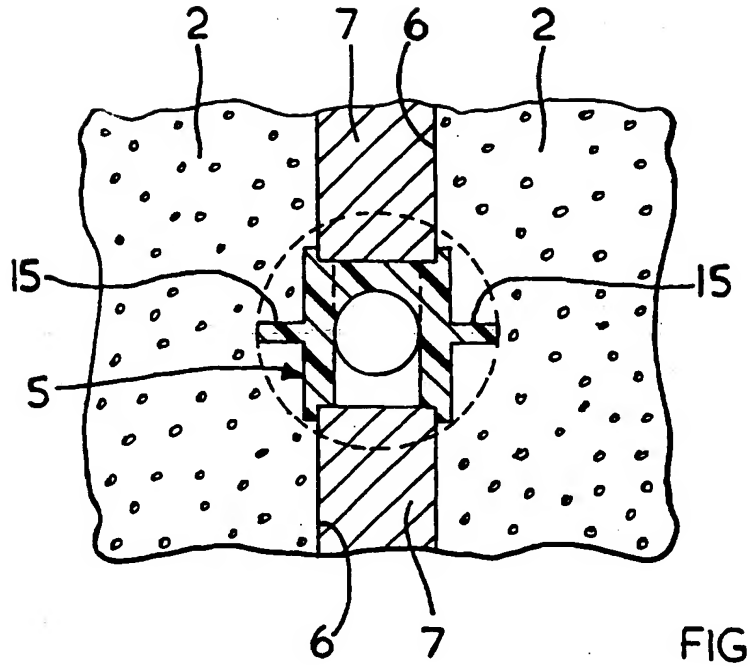

FIG. 4

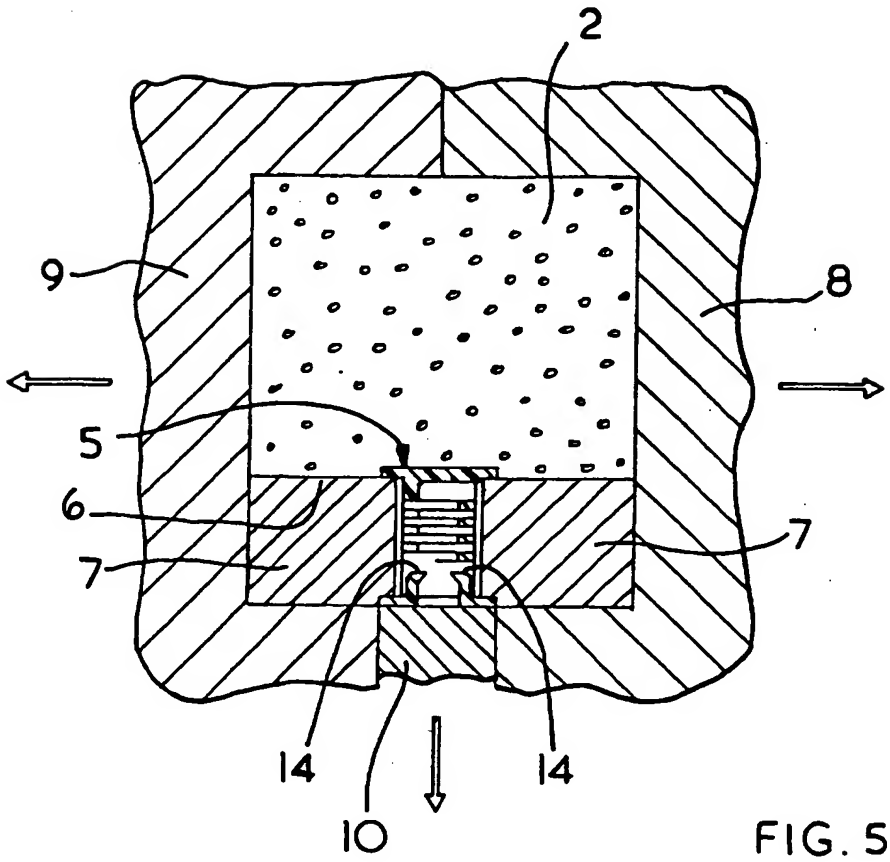

FIG. 5

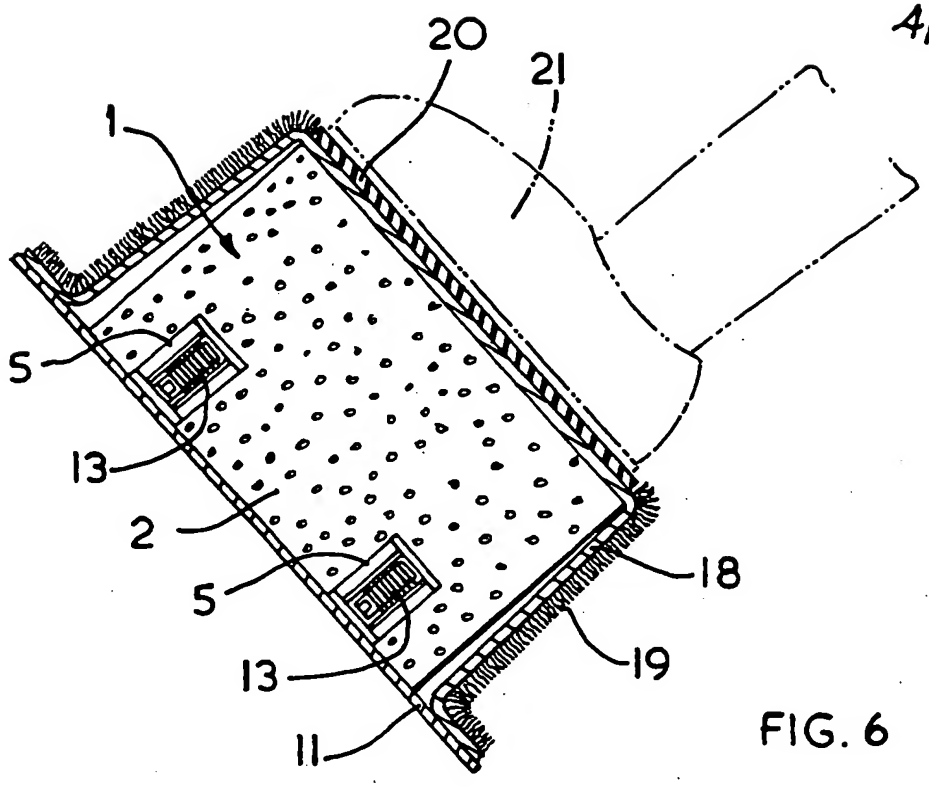

FIG. 6

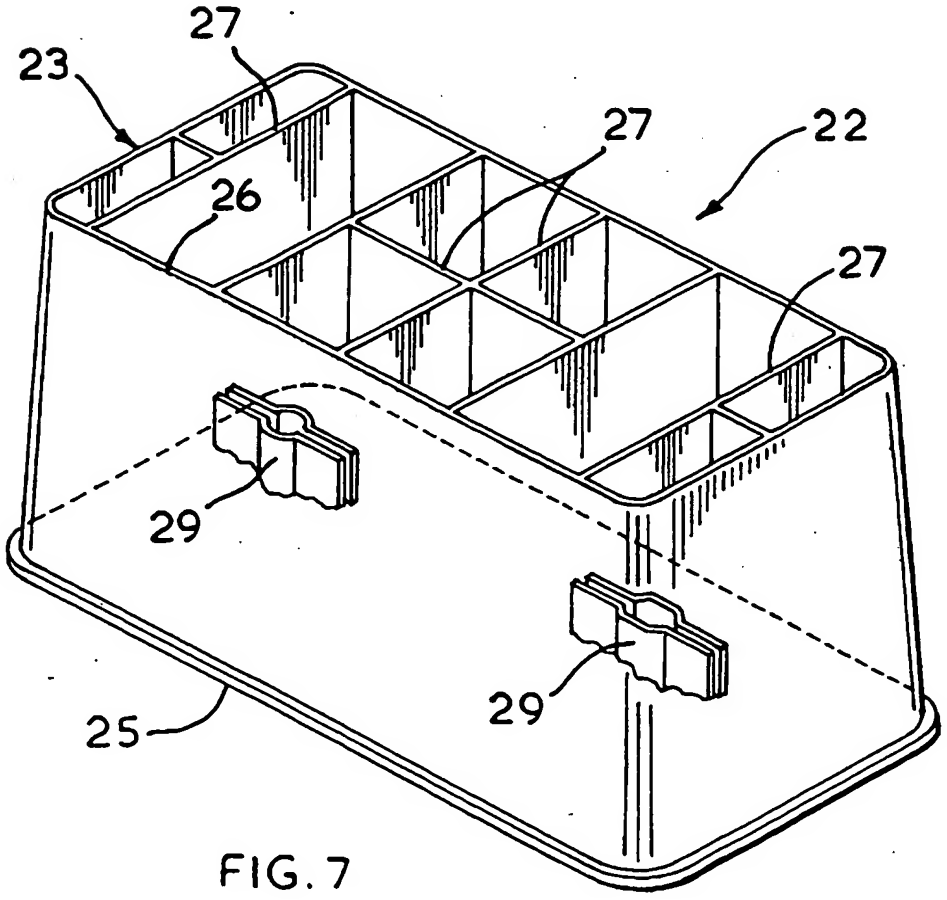

FIG. 7

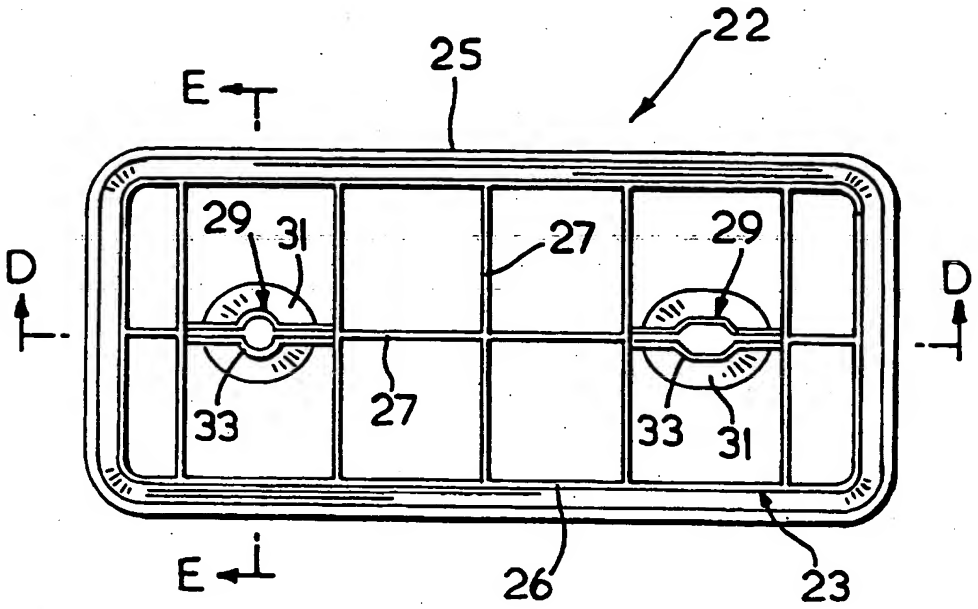

FIG. 8

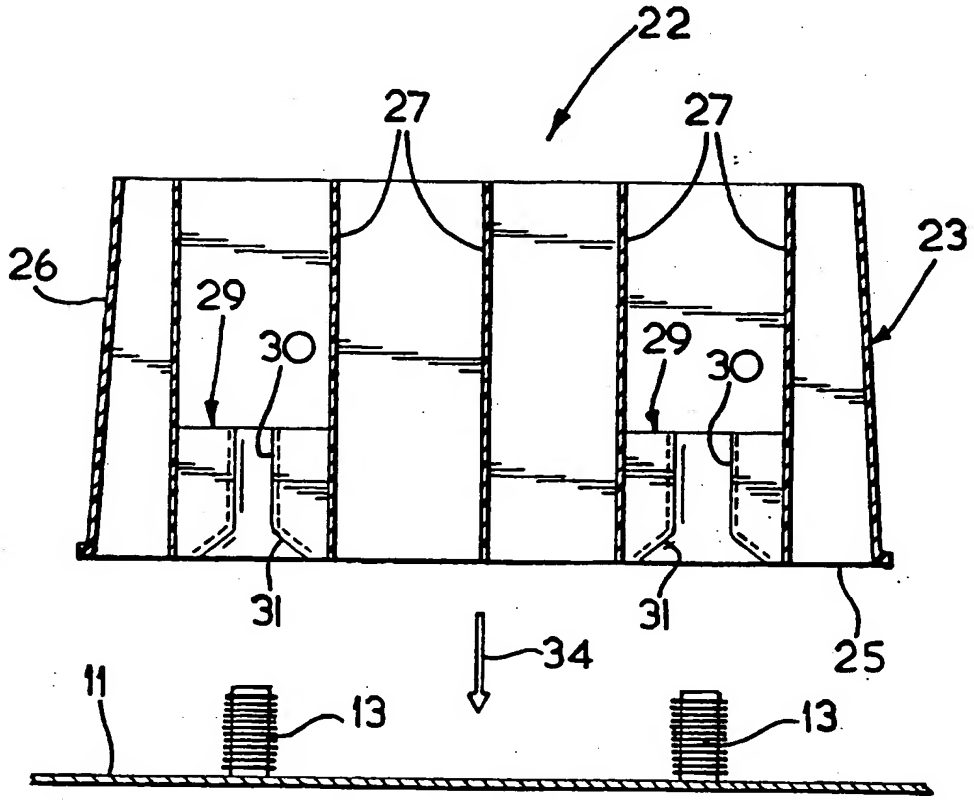

FIG. 9

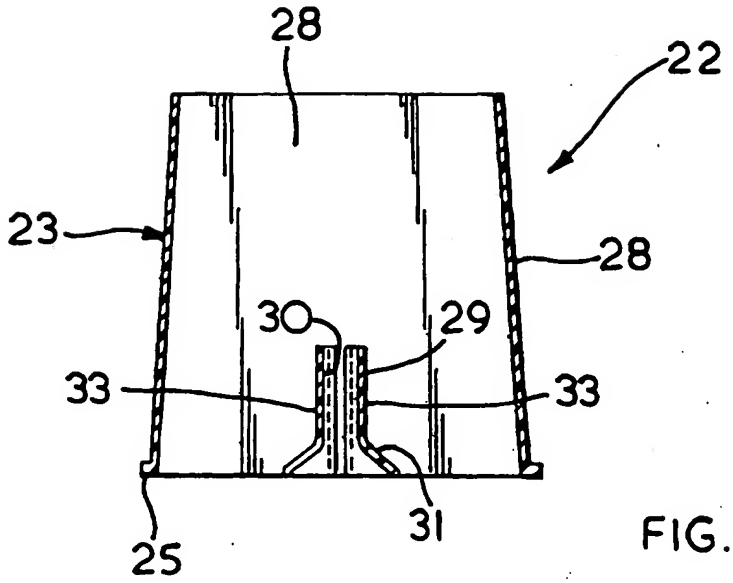

FIG.10

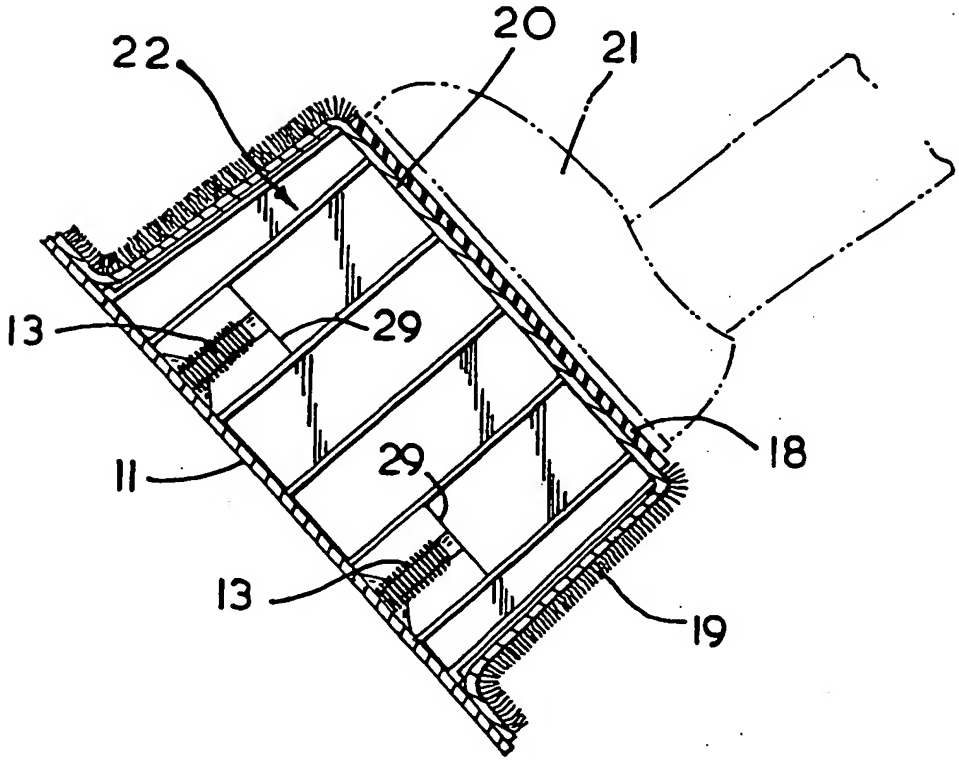

FIG. 11

FOOTREST MOUNTING STRUCTURE

The present invention relates to a footrest mounting structure for mounting a footrest by use of threaded studs or grooved rod-like studs attached to the floor of a vehicle body.

Various methods have been employed to mount a footrest on the floor of a vehicle body. There is one method of mounting a footrest by use of either threaded studs or circumferentially grooved rod-like studs having circumference grooves on the outer surface thereof. Japanese Utility Model Publication No. 05-001686 discloses a structure for mounting the stopper of an accelerator pedal by use of the threaded studs fixed to the floor. The accelerator pedal stopper mounting structure can mount the stopper easily since it uses the threaded studs fixed to the floor. In a case where this mounting structure is applied for mounting a footrest, however, upon collision of vehicles, the driver's foot rested on the accelerator pedal might be injured by deformation of the vehicle body and further the footrest coming off and into the vehicle room.

In order to avoid such injury, there is proposed to sandwich a cushion member between the carpet and the floor in the footrest portion of the floor. This footrest portion is useful to absorb the shock of a collision. However, since there is provided no stopper for the cushion member that constitutes a portion of the footrest body, it is difficult to properly position the cushion member on the floor. Further, the footrest body might be displaced. Japanese Utility Model Publication No. 05-033388 discloses a footrest mounting structure that a filler is insert-molded in an urethane packing layer in the footrest portion of floor carpet, a concave groove is formed on this filler, projections are fixed to the floor, and the carpet including the footrest is disposed and fixed at the footrest position. This footrest mounting structure not only can position the footrest, but also can absorb the shock of a collision. As the footrest is embedded in the carpet, however, the footrest can not handle separately. Furthermore, Japanese Utility Model Laid-open No. 06-045868 discloses a structure for mounting a pad on a vehicle panel by use of T-shape studs fixed to the panel. This pad mounting structure does not use the rod-like stud such as the threaded stud or the like.

Therefore, an object of the present invention is to provide a footrest mounting structure that can surely position the footrest by use of threaded studs or

circumferentially grooved rod-like studs which are attached to the floor of a vehicle body, and can also absorb the shock of a collision.

According to the first aspect of the present invention, there is provided a footrest mounting structure for mounting a footrest by use of a threaded stud or a grooved rod-like stud attached to the floor of a vehicle body, wherein a footrest body is made from a solid body of soft material such as urethane, wherein on a floor mounting side of the footrest body, a rigid tubular clip for receiving the stud is immovably fixed at the position corresponding to the stud, and wherein the clip is pressed to receive the studs therein, so that the footrest body is mounted on the floor.

The footrest can be surely positioned separately from the carpet or the like. The footrest body can absorb the shock of a collision very well. Further, the footrest body will never be displaced.

According to the second aspect of the present invention, there is provided a footrest mounting structure for mounting a footrest by use of a threaded stud or a grooved rod-like stud attached to the floor of a vehicle body, wherein a footrest body is made as a box-like configuration having a structure capable of absorbing the shock of a collision with the footrest body comprising a plurality of thin plates connected with each other to form a number of cavities therein, and wherein on the floor mounting side of the box-like footrest body to be mounted on the floor, a generally tubular stud receiving portion is formed for receiving the stud and to frictionally engage with either the threads of threaded stud or the outer surface of the grooved stud, and wherein the stud receiving portion is pressed to receive the stud therein, so that the footrest body is mounted on the floor. In this footrest mounting structure, the footrest can also be surely positioned separately from the carpet or the like. The shock absorbing capability of footrest body can be kept at high level. Further, the footrest body will never be displaced.

Two embodiments of the invention will now be described with reference to the accompanying drawings of which:-

Figure 1 is a perspective view of the footrest according to a first embodiment of the present invention, in which clips located inside are shown;

Figure 2 is a plan view of the footrest of Figure 1;

Figure 3 is a sectional view of the footrest taken along line A-A of Figure 2, and shows that the footrest has not yet been attached to the threaded studs of the floor;

Figure 4 is a sectional view of the clip portion taken along line C-C of Figure 3;

Figure 5 is a sectional view of the footrest taken along line B-B of Figure 2;

Figure 6 is a sectional view showing an example of the use of the footrest mounted on the floor, according to the first embodiment of the present invention;

Figure 7 is a perspective view of the footrest according to a second embodiment, showing the stud receiving portions inside of the footrest;

Figure 8 is a plan view of the footrest of Figure 7;

Figure 9 is a sectional view of the footrest taken along line D-D of Figure 8;

Figure 10 is a sectional view of the footrest taken along line E-E of Figure 8; and

Figure 11 is a sectional view showing an example of the use of the footrest mounted on the floor, according to the second embodiment of the present invention.

Referring to the drawings, two embodiments of the present invention will now explained. Figures 1-6 show a first embodiment of a footrest for a footrest mounting structure according to the present invention, and Figures 7-11 shows a second embodiment according to the present invention.

In Figures 1-6, a footrest 1 includes a footrest body 2 made from a solid body of soft material such as urethane or the like which has an excellent vibration absorption capability, and clips 5 firmly fixed to a floor mounting side 3 of the footrest body, which is to be mounted on the floor. The footrest body 2 is made from a solid body of soft material, forming a generally rectangular solid body, which can absorb the shock of collision against the driver's foot rested on it. A plurality (two, in an illustrated example) of clips 5 are positioned at such positions that correspond to either threaded studs or circumferentially grooved rod-like studs having circumferential grooves thereabout, and that the footrest body 2 can be stably mounted. Each clip 5 is formed as a tubular body to receive the stud. Each clip 5 has sufficient rigidity to engage with the stud so that the footrest body 2 can be firmly mounted. For example, each clip 5 is preferably molded from hard plastic material.

The clips 5 are insert-molded during molding the footrest body 2 so as to be firmly fixed to the footrest body 2. To this end, the clips 5 are fabricated earlier than fabrication of the footrest body 2. Furthermore, in order to position and hold the clips 5 during insert-molding, slits 6 are formed at the positions corresponding to the opposite sides of the clip 5. As shown in Figure 4 which is a sectional view taken along line C-C

of Figure 3, the slits 6 are also used to locate members 7 which prevent resin for the footrest body 2 from flowing to the clips 5 during molding the footrest body 2. If the clips 5 can be positioned and held and the flow of molding resin to the clips 5 can be prevented, however, the slits 6 are not necessary. As shown in Figure 5 which is a sectional view taken along line B-B, the insert-molding is accomplished by use of molding dies 8, 9 and 10 for the footrest body 2. An arrow written for each of the molding dies 8-10 indicate the die removing directions. If the clips 5 can properly and be surely fixed to the footrest body 2, the insert-molding may not necessarily be used. For example, mounting holes may be formed in the footrest body 2 so that the clips 5 can be fitted into these mounting holes.

As shown in Figures 3 and 5, each clip 5 is made as a tubular body to receive a rod-like stud, such as a threaded stud 13 (or a circumferentially grooved stud) fixed to and upstanding from the floor. In the inner side of tubular body, a pair of engaging pawls 14 engaging with the threads of the stud are formed. Also, on the outer surface of tubular body, a pair of ribs 15 projecting into the footrest body 2 and extending in a longitudinal direction are formed. The rib 15 bites into the footrest body 2 to prevent the clips 5 from rotating about its axis and displacing its position. The ribs 15 serve also to reinforce the clips 5.

The footrest 1 fabricated as described above, as shown in Figure 3, is oriented so that the floor mounting side 3 of the footrest body 2 faces with the threaded studs 13 fixed to the floor 11 in standing fashion, then the clips 5 are positioned at the positions corresponding to the threaded studs 13. Then, the footrest body 2 is pressed down in a direction of an arrow 17 of Figure 3 so that the clips 5 receive the respective threaded studs 13. By this pressing down operation, the engaging pawls 14 of the clip 5 engage with the threads of stud 13 to thereby mount the footrest 1 on the floor 11. Figure 6 shows the situation of the footrest 1 mounted on the floor 11. As shown in Figure 6, the footrest 1 may be covered with a first floor carpet 18 and a second floor carpet 19 which are laid on the floor 11 so that the footrest 1 is not exposed. Furthermore, an anti-slip plate 20 made from rubber or the like may be attached on the tread of footrest 1. A driver operates a vehicle with his foot 21 which is rested on the footrest 1 during driving. Even if the vehicle had a collision, his foot would never be injured since the shock of a collision against the foot is absorbed by the vibration absorbing capability of the footrest

body 2. Also, the footrest 1 would never be displaced or shifted on the floor 11 because the clips 5 are firmly fixed to the footrest body 2 and surely engage with the threaded studs 13.

Figures 7-11 show a footrest 22 according to a second embodiment of the present invention. The footrest 22 comprises a box-like footrest body 23 which have a plurality of thin plates of hard plastic material connected to each other and is able to absorb the shock of a collision. The footrest body 23 is composed of an outer wall thin plate 26 standing substantially perpendicular to a floor mounting side 25 of the footrest body to define an internal hollow space therein, and a plurality of thin plates 27 standing substantially perpendicular to the floor mounting side 25. The thin plates are connected to each other into a lattice form. The floor mounting side 25 of the outer wall thin plate 26 is formed as a seat that has a wide seating area to ensure that the footrest body 23 is stably mounted on the floor. Each of the outer wall thin plate 26 and the inner thin plates 27 has a strength sufficient to rest a foot thereon as a footrest, but the strength is as weak as to allow the deformation of them due to the strong force such as the shock of a collision.

As shown in Figure 9, on the floor mounting side 25 of the box-like footrest body 23, tubular stud receiving portions 29 are formed to receive the threaded studs 13 fixed to the floor 11 while frictionally engaging with the threads of threaded studs 13. Again, in this embodiment, the threaded stud 13 may be replaced by another type of a stud, for example, a circumferentially grooved stud, as long as it is a rod-like stud. A plurality (two in illustrated example) of stud receiving portions 29 corresponding to the number of the studs 13, are formed. Similarly, the distance between the stud receiving portions 29 corresponds to the distance between the studs 13. Each stud receiving portion 29 is formed to define a cavity 30 having such a diameter that is a little smaller than the outer diameter of the stud 13. An inlet portion 31 of the cavity 30 is tapered to form a wide opening for receiving the stud easily. A middle portion 33 thereof frictionally engaging with the stud has a flexibility so that it is bent radially outward by the received stud. In the illustrated embodiment, each stud receiving portion 29 is formed such that the cavity 30 and the inlet portion 31 are defined by two flexible plates to receive the threaded stud 13 while frictionally engaging with the threads of the stud. Furthermore, one (right side one in Figures 8 and 9) of the two stud receiving portions

29 is formed such that it is elliptical in section at the cavity 30. By forming the stud receiving portions in that manner, the difference or pitch error of the distance between studs 13 from the distance between stud receiving portions 29 can be corrected.

When mounting the footrest 22 as indicated by an allow 34 of Figure 9, the floor mounting side 23 of footrest body 22 is oriented to face with the threaded studs 13 standingly fixed to the floor 11, and then the stud receiving portions 29 are aligned with the positions corresponding to the threaded studs 13. Then, the footrest 22 is pressed down so that the stud receiving portions 29 receive respective threaded studs 13. By this pressing down operation, the cavities 30 of the stud receiving portions 29 engage with the threads of threaded studs 13, so that the footrest 22 is mounted on the floor 11. Figure 11 shows the condition that the footrest 22 is mounted on the floor 11. Similar to the case of Figure 6, a first floor carpet 18 and a second floor carpet 19 are laid on the floor 11 to cover the footrest 22. The anti-slip plate 20 is provided on the tread of footrest 22. Even if a vehicle had a collision during driving, driver's foot would not be injured since the shock of a collision to the foot is absorbed by the vibration absorbing capability of the footrest 22. Also, the footrest 22 does would not displaced or shifted on the floor 11 because the stud receiving portions 29 surely engage with the threaded studs 13.

According to the present invention, the footrest is positioned and fixed on the floor independent of the carpet or the like. Furthermore, the footrest body absorbs the shock of a vehicle collision very well, thereby the displacement or position shifting of the footrest body does not occur. The shock absorbing capability is kept at high level.

Claims

1. A footrest mounting structure for mounting a footrest by use of a threaded stud or a grooved rod-like stud attached to the floor of a vehicle body, wherein a footrest body is made from a solid body of soft material such as urethane, wherein on a floor mounting side of the footrest body, a rigid tubular clip for receiving the stud is immovably fixed at the position corresponding to the stud, and wherein the clip is pressed to receive the studs therein, so that the footrest body is mounted on the floor.

2. A footrest mounting structure of claim 1, wherein the clip is fabricated earlier than fabrication of the footrest body, and then the clip is insert-molded during molding the footrest body, so as to be fixed to the footrest body.

3. A footrest mounting structure of either of claims 1 or 2, wherein a rib projecting into the footrest body is formed on an outer surface of the clip.

4. A footrest mounting structure for mounting a footrest by use of a threaded stud or a grooved rod-like stud attached to the floor of a vehicle body, wherein a footrest body is made as a box-like configuration having a structure capable of absorbing the shock of a collision with the footrest body comprising a plurality of thin plates connected with each other to form a number of cavities therein, and wherein on the floor mounting side of the box-like footrest body to be mounted on the floor, a generally tubular stud receiving portion is formed for receiving the stud and to frictionally engage with either the threads of threaded stud or the outer surface of the grooved stud, and wherein the stud receiving portion is pressed to receive the stud therein, so that the footrest body is mounted on the floor.

5. A footrest mounting structure of claim 4, wherein the stud receiving portion is formed as a cavity having a diameter which is a little smaller than an outer diameter of the stud, an inlet portion of the cavity is tapered to form a wide opening for receiving the stud easily, and a middle portion of the cavity frictionally engaging with the stud has a flexibility to be bent radially outward by the received stud.

6. A footrest mounting structure of either of claims 3 or 4, wherein the footrest body is formed by an outer wall thin plate standing substantially perpendicularly to the floor mounting side of the footrest body, and a plurality of thin plates standing substantially perpendicularly from the floor mounting side within the internal hollow portion of the footrest body with each of the plurality of the thin plates being connected with each other to form a lattice.

7. A footrest mounting structure as hereinbefore described with reference to the accompanying drawings.

The Patent Office

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Application No: GB 9928850.8 **Examiner:** Peter Gardiner
Claims searched: 1-3,6 **Date of search:** 23 March 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.7): B60N: 3/06
B60R: 21/04, 21/055
B62D: 25/20

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	EP 0590993 A1	EMHART INC (see abstract and figure 2)	1,6
Y	US 3860284	SANFORD LICHTIG (see column 2 lines 4 to 8, and figures 1 to 3)	1,6
Y	JP 09-328033	NIPPON PLAST (see abstract and figures 3 and 4)	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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